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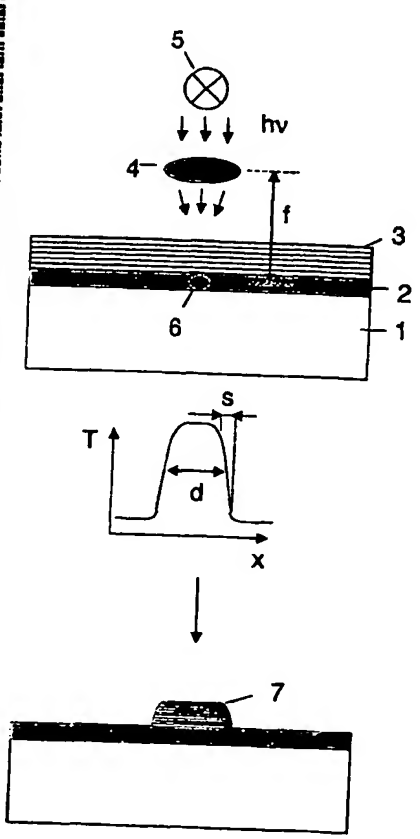
[Continued on next page]

(54) Title: LASER PARRERING OF DEVICES



(57) Abstract: A method for forming an organic or partly organic switching device, comprising: depositing layers of conducting, semiconducting, insulating, or surface modifying layers by solution processing and direct printing; and defining high-resolution patterns of these layers by exposure to a focussed laser beam.

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Published:

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 02/02405

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H01L51/40 G03F9/00 H01L21/768

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H01L G03F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
INSPEC, EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WONG T K S ET AL: "Patterning of poly(3-alkylthiophene) thin films by direct-write ultraviolet laser lithography" MATERIALS SCIENCE AND ENGINEERING B, ELSEVIER SEQUOIA, LAUSANNE, CH, vol. 55, no. 1-2, 14 August 1998 (1998-08-14), pages 71-78, XP004142052 ISSN: 0921-5107 abstract; figures 1,3 --- -/--	1-6,12, 13,19, 24,29, 31,34, 41,42,59

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
5 September 2002	12.11.2002

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Königstein, C

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 02/02405

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE LEEUW D M ET AL: "Polymeric integrated circuits and light-emitting diodes" ELECTRON DEVICES MEETING, 1997. TECHNICAL DIGEST., INTERNATIONAL WASHINGTON, DC, USA 7-10 DEC. 1997, NEW YORK, NY, USA,IEEE, US, 7 December 1997 (1997-12-07), pages 331-336, XP010265518 ISBN: 0-7803-4100-7 the whole document	1,2,25, 27,41, 42,50,51
X	WO 01 20691 A (LEEUW DAGOBERT M DE ;TOUWSLAGER FREDERICUS J (NL); GELINCK GERWIN) 22 March 2001 (2001-03-22) page 9	1-6
X	LOWE J ET AL: "POLY(3-(2-ACETOXYETHYL)THIOPHENE): A MODEL POLYMER FOR ACID-CATALYZED LITHOGRAPHY" SYNTHETIC METALS, ELSEVIER SEQUOIA, LAUSANNE, CH, vol. 85, 1997, pages 1427-1430, XP000826731 ISSN: 0379-6779 figure II	1-5
X	COLLE M ET AL: "Patterning of organic light-emitting diodes containing a layer of perylene derivative using an He-Ne laser" 2ND INTERNATIONAL CONFERENCE ON ELECTROLUMINESCENCE OF MOLECULAR MATERIALS AND RELATED PHENOMENA, SHEFFIELD, UK, 15-18 MAY 1999, vol. 111-112, pages 95-97, XP001104048 Synthetic Metals, 1 June 2000, Elsevier, Switzerland ISSN: 0379-6779 the whole document	1,2,26, 31,33
A	EP 0 773 479 A (MOTOROLA INC) 14 May 1997 (1997-05-14) the whole document	1-6

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB 02/02405

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-16,12,13,19,24-27,29-31,33-35,41,42,50,51,59.

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-6,12,13,19,24-27,29-31,33-35,41,42,50,51

Patterning of a polymer layer

The prior art (T. K. S. Wong, S. Gao, X. Hu, Y. C. Chan, and Y. L. Lam, Mat. Sci. Eng. B55 (1998) 71-78.) describes the patterning of a poly(3-alkylthiophene) film by direct light UV laser lithography.

The new features in claims 1-6,12,13,19,24-27,29-31,33-35,41,42,50,51 are a laser beam resolution of less than 1 micrometer.

The special technical feature as defined in rule 13(2) PCT is the laser beam resolution of less than 1 micrometer.

The objective problem is to improve the patterning resolution.

2. Claims: 7-11,28,43-45,60-65

Modification of the surface free energy

The prior art (T. K. S. Wong, S. Gao, X. Hu, Y. C. Chan, and Y. L. Lam, Mat. Sci. Eng. B55 (1998) 71-78.) describes the patterning of a poly(3-alkylthiophene) film by direct light UV laser lithography.

The new features in claims 7-11,28,43-45,60-65 are a method of selectively exposing a first layer of material on the substrate to a laser beam so as to change localy the surface properties in order to enable the subsequent selective deposition of a (second) layer of organic material.

The special technical feature as defined in rule 13(2) PCT is a method of selectively exposing a first layer of material on the substrate to a laser beam so as to change localy the surface properties in order to enable the subsequent selective deposition of a (second) layer of organic material.

The objective problem is to selectively change the surface properties of a first layer in order to enable the subsequent selective deposition of a (second) layer of organic material.

3. Claims: 14-17

Reactive Laser Deposition

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

The prior art (T. K. S. Wong, S. Gao, X. Hu, Y. C. Chan, and Y. L. Lam, Mat. Sci. Eng. B55 (1998) 71-78.) describes the patterning of a poly(3-alkylthiophene) film by direct light UV laser lithography.

The new features in claims 14-17 are the selective deposition of a meterial by inducing a chemical reaction by laser light.

The special technical feature as defined in rule 13(2) PCT is the selective deposition of a meterial by inducing a chemical reaction by laser light.

The objective problem is to selectively deposit a patterned layer of meterial by inducing a chemical reaction by laser light.

4. Claims: 18,32

Modifaction of the volume

The prior art (T. K. S. Wong, S. Gao, X. Hu, Y. C. Chan, and Y. L. Lam, Mat. Sci. Eng. B55 (1998) 71-78.) describes the patterning of a poly(3-alkylthiophene) film by direct light UV laser lithography.

The new features in claims 18,32 are the selctive modification of the volume of a layer by exposing to an (IR) laser.

The special technical feature as defined in rule 13(2) PCT is the selctive modification of the volume of a layer by exposing to an (IR) laser.

The objective problem is to selctively modify the volume of a layer by exposing to a laser.

5. Claims: 36-40,77-92

Alignment

The prior art (T. K. S. Wong, S. Gao, X. Hu, Y. C. Chan, and Y. L. Lam, Mat. Sci. Eng. B55 (1998) 71-78.) describes the patterning of a poly(3-alkylthiophene) film by direct light UV laser lithography.

The new features in claims 36-40,77-92 are a method for determing the relative alignment of a feature on a susbtrate.

The special technical feature as defined in rule 13(2) PCT is a method for determing the relative alignment of a feature on a susbtrate.

The objective problem is to determine the relative alignment of a feature on a susbtrate.

6. Claims: 46-49

Transfer Printing

The prior art (T. K. S. Wong, S. Gao, X. Hu, Y. C. Chan, and Y. L. Lam, Mat. Sci. Eng. B55 (1998) 71-78.) describes the patterning of a poly(3-alkylthiophene) film by direct light UV laser lithography.

The new features in claims 46-49 are a method comprising exposing a layer of material on a second substrate to a focussed laser beam so as to transfer a pattern of the layer of material onto the first substrate.

The special technical feature as defined in rule 13(2) PCT is a method comprising exposing a layer of material on a second substrate to a focussed laser beam so as to transfer a pattern of the layer of material onto the first substrate.

The objective problem is to transfer a pattern of a layer of material from a second onto a first substrate.

7. Claims: 52-58

Masking layer

The prior art (T. K. S. Wong, S. Gao, X. Hu, Y. C. Chan, and Y. L. Lam, Mat. Sci. Eng. B55 (1998) 71-78.) describes the patterning of a poly(3-alkylthiophene) film by direct light UV laser lithography.

The new features in claims 52-58 are a method in which a portion of the focussed light beam is blocked or attenuated by a previously patterned third layer on the substrate, so as to bring about modification of said first patterned layer on the substrate only in the regions in which the light is blocked or attenuated.

The special technical feature as defined in rule 13(2) PCT is a method in which a portion of the focussed light beam is blocked or attenuated by a previously patterned third layer on the substrate, so as to bring about modification of said first patterned layer on the substrate only in the regions in which the light is blocked or attenuated.

The objective problem is to bring about modification of a patterned layer on the substrate only in the regions in which the light is blocked or attenuated by a previously patterned third layer on the substrate.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

8. Claims: 66-76

Interconnect patterning

The prior art (T. K. S. Wong, S. Gao, X. Hu, Y. C. Chan, and Y. L. Lam, Mat. Sci. Eng. B55 (1998) 71-78.) describes the patterning of a poly(3-alkylthiophene) film by direct light UV laser lithography.

The new features in claims 66-76 are a method of modifying circuit features comprising removing electrical connections using a laser.

The special technical feature as defined in rule 13(2) PCT is a method of modifying circuit features comprising removing electrical connections using a laser.

The objective problem is to modify circuit features by removing electrical connections.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/GB 02/02405

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 0120691 A	22-03-2001	EP 1138091 A	04-10-2001
EP 0773479 A	14-05-1997	NONE	